WHAT IS CLAIMED IS:

1. A balloon-deployable and controlled radially expandable stent comprising:

an armature comprising a first material having an elasticity allowing an expansion over time of said armature;

a matrix comprising a second material having a rigidity and a conformation allowing a retention of said armature in a contracted position;

said stent being deployed with the help of a balloon introduced into said armature, said balloon allowing an irreversible deformation of said matrix during inflation of said balloon and allowing expansion of the armature.

2. The stent of claim 1, wherein said armature and said matrix are structures of similar rigidity.

3. The stent of anyone of claims 1 and 2, wherein said first material is a shape memory alloy.

4. The stent of claim 3, wherein said metal shape memory alloy is nitinol.

5. The stent of claim 1, wherein said second material is a polymer and said deformation is plastic.

6. The stent according to anyone of claims 1 to 5, wherein said matrix is fortified into a rigid geometry by rings.

7. The sent according to claim 6, wherein said rings are selected in the group comprising a coating made of rings covering completely

said armature, rings braided around said armature, and rings secured in slots provided on said armature.

8. The stent of anyone of claims 1 to 7, wherein said second material has a rigidity of at least 1000 MPa, a yield strain below about 8%, and an ultimate strain over about 100 %.

9. The stent of anyone of claims 1 to 8, wherein said second material is selected in the group comprising a polycarbonate and a polyethylene.

10. The stent of anyone of claims 8 to 9, wherein said second material further exhibits creep properties allowing a minimum loss of 50% of an initial rigidity within 1000 hours.

11. The stent of anyone of claims 1 to 10, wherein the matrix conformation is annular.

12. The stent of anyone of claims 1 to 11, further comprising a retention sheath covering said matrix and said armature, and recuperating expansion forces of said armature by preventing a creep of said matrix.

13. A method of angioplasty in an artery of a patient comprising:

introducing and positioning in a vessel of the patient a self-deploying stent having a progressive deployment comprising an armature comprising a material having an elasticity allowing self-deployment of the

armature; and a matrix comprising a second material having a rigidity and a conformation allowing a retention of the armature in a contracted position;

deploying the armature using a balloon delivered in the armature, the balloon ensuring an irreversible deformation of the matrix during inflation of the balloon and allowing a self-deployment of the armature; and

removing the balloon from the vessel;

whereby a progressive self-deployment of the armature allows a positioning of the armature at a predetermined position and a diminution of a risk of restenosis.

14. The method of claim 13, wherein the armature comprises a shape memory alloy.

15. The method of claim 14, wherein the shape memory alloy is nitinol.

16. The method of anyone of claims 13 to 15, wherein the second material is a polymer and wherein the deformation is plastic.

17. The method of claim 16, wherein the polymer has a rigidity of at least 1000 MPa, a yield strain below about 8%, and an ultimate strain over about 100 %.

18. The method of anyone of claims 15 and 16, wherein the polymer is selected in the group comprising a polycarbonate and a polyethylene polymer.

19. The method of anyone of claims 17 and 18, wherein the polymer further exhibits creep properties characterized by a loss of rigidity of at least 50% of an initial rigidity thereof within 1000 hours.

20. The method of anyone of claims 13 to 19, further comprising before step a) an expulsion of said stent from a retention sheath covering the matrix and the armature and recuperating the expansion forces of the armature by preventing a creep of the matrix.

21. The stent of claim 1, wherein said first material has radio-opacity and rigidity properties comparable to metal.

AMENDED CLAIMS

[received by the International Bureau 21 April 2004 (2.04.04);
original claims 1 to 21 replaced by new claims 1 to 18 (3 pages)]

1. A balloon-deployable stent comprising:

an armature made in a first material allowing an expansion over time of said armature;

a matrix made in a second material, said matrix being added on said armature;

wherein said second material gradually loses mechanical properties thereof by creeping, after the stent is deployed under a deployment of a balloon introduced into said armature, thereby allowing a controlled radial expansion of said armature over a period of time.

2. The stent of claim 1, wherein said second material loses the mechanical properties thereof at a temperature encountered in a human body.

3. The stent of any one of claims 1 and 2, wherein said second material comprises at least in part polymeric materials, said second material having an initial rigidity sufficient to maintain the stent in a contracted position on the balloon during storage, a low yield strain from an elastic to a plastic regime, a sufficiently high total elongation, and creeping properties at human body temperature.

4. The stent of claim 3, wherein the initial rigidity of said second material is at least 1000 MPa, the yield strain thereof is less than about 8%, the total elongation thereof is greater than about 100 %, and the creeping properties thereof allow a loss of at least 50% of the initial rigidity thereof within 1000 hours.

5. The stent according to any one of claims 1 to 4, wherein said matrix comprises a number of rings.

6. The stent according to claim 5, wherein said rings are selected in the group consisting of rings braided around said armature and rings secured in slots provided on said armature.

7. The stent according to any one of claims 1 to 4, wherein said matrix is a coating deposited on said armature.

8. The stent of any one of claims 1 to 7, wherein said first material is a shape memory alloy.

9. The stent of claim 8, wherein said metal shape memory alloy is nitinol.

10. The stent of any one of claims 1 to 9, wherein said second material is selected in the group consisting of polycarbonate and polyethylene.

11. The stent of any one of claims 1 to 10, wherein said stent, including said matrix, mounted on the balloon, is introduced into a retention sheath preventing a creep of said matrix during storage of the stent, thereby preventing a deployment of the armature.

12. A method for expanding a lumen, comprising:

a) introducing in the lumen a stent comprising an armature made in a first material allowing self-deployment of the armature, and a matrix made in a second material having creep properties that make it gradually lose mechanical properties thereof;

b) deploying the armature using a balloon positioned in the armature, the balloon ensuring an irreversible deformation of the matrix during inflation of the balloon and allowing a self-deployment of the armature; and

c) removing the balloon from the lumen;

whereby the creep properties of the second material allow the progressive self-deployment of the armature and a positioning of the armature at a predetermined position in the lumen with minimised damage on walls of the lumen.

13. The method of claim 12, wherein the second material comprises at least in part polymeric materials and has an initial rigidity sufficient to maintain the stent in a contracted position on the balloon during storage, a low yield strain from

an elastic to a plastic regime, a sufficiently high total elongation, and creep properties temperatures encountered in a human body.

14. The method of claim 13, wherein the initial rigidity of the second material is at least 1000 MPa, the yield strain thereof is less than about 8%, the total elongation thereof is at least about 100 % and the creep properties thereof allow a loss of at least 50% of the initial rigidity within 1000 hours.

15. The method of any one of claims 12 to 14, wherein the armature comprises a shape memory alloy.

16. The method of claim 15, wherein the shape memory alloy is nitinol.

17. The method of any one of claims 12 to 16, wherein the second material comprises a polymer selected in the group consisting of polycarbonate and polyethylene.

18. The method of any one of claims 12 to 17, further comprising before step a) removing the stent from a retention sheath covering the matrix and the armature.